

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

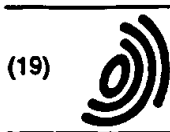
Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

## **IMAGES ARE BEST AVAILABLE COPY.**

As rescanning documents *will not* correct images,  
Please do not report the images to the  
Image Problem Mailbox.

#2



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) EP 1 001 443 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:  
17.05.2000 Bulletin 2000/20

(51) Int Cl.7: H01H 13/70

(21) Application number: 99122502.0

(22) Date of filing: 11.11.1999

(84) Designated Contracting States:  
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE  
Designated Extension States:  
AL LT LV MK RO SI

(72) Inventor: Kitamura, Toshiyasu  
Yokohama-shi, Kanagawa (JP)

(74) Representative: Grünecker, Kinkeldey,  
Stockmair & Schwanhäusser Anwaltssozietät  
Maximilianstrasse 58  
80538 München (DE)

(30) Priority: 12.11.1998 JP 32214698

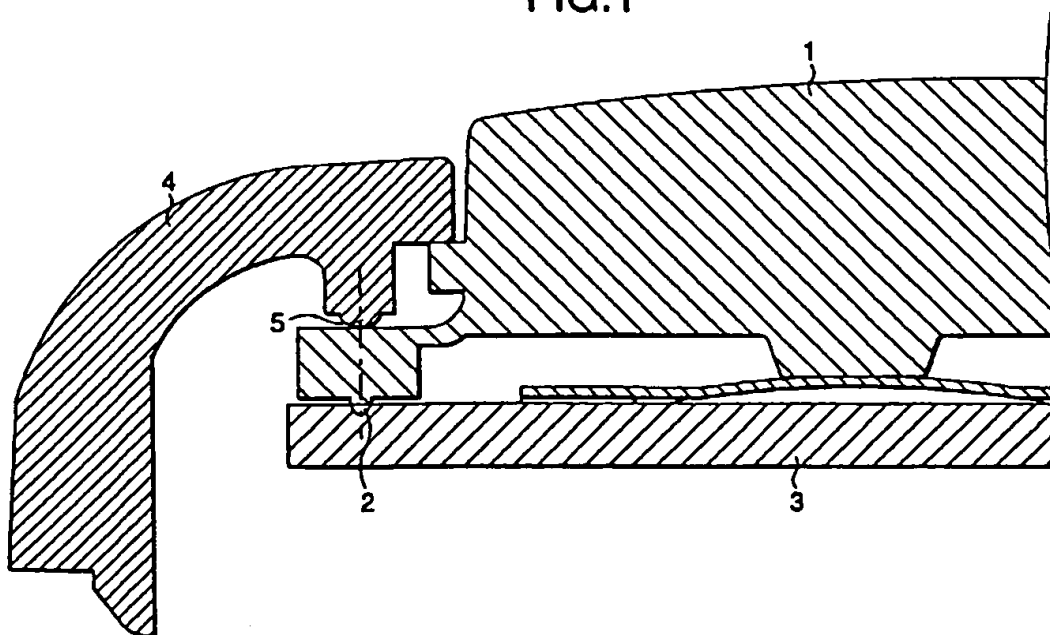
(71) Applicant: MATSUSHITA ELECTRIC INDUSTRIAL  
CO., LTD  
Kadoma-shi, Osaka 571-0000 (JP)

(54) Portable terminal device

(57) A water-proof structure of a key sheet periphery portion of a portable terminal device. The device includes an upper cover having a rib with a substantially convex cross-section provided around an operating portion, a printed board for receiving an operation input from the operating portion, and a key sheet provided be-

tween the upper cover and the printed board, having a rib with a substantially convex cross-section provided contacting with the printed board with a center shared with the rib with the substantially convex cross-section provided in the upper cover. The key sheet is provided with input buttons (key top) constituting the operating portion.

FIG.1



EP 1 001 443 A1

## Description

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

[0001] The present invention relates to a portable terminal device and in particular, it relates to one provided with a water-proof structure with improved assembling property and water-proof property so as to prevent entrance of water or the like from the periphery of an operating portion into the inside of the main body of the device.

#### 2. Description of the Related Art

[0002] Conventionally, as portable terminal devices, such as a portable phone device and a PHS, one shown in FIGS. 5A and 5B has been known. That is, according to the water-proof structure of the key sheet periphery portion of the portable terminal device shown in FIG. 5B, a rib 12 is provided in a key sheet 11 made from a silicone rubber, with the rib 12 contacting with an upper cover 10 so as to prevent entrance of water or the like from the surface portion of the key sheet 11 into the inside of the main body of the device, such as a printed board 13. FIG. 5A is an enlarged view of the portion of the FIG. 5B surrounded by the two-dot chain line, showing an example of the rib 12 accurately contacting with the upper cover 10.

[0003] Recently, tasks such as a small size, a light weight and weight reduction of a portable terminal device have been the principal part in designing portable terminal devices. With the conventional shapes, it is difficult to achieve the tasks. That is, with the conventional water-proof structure of the key sheet periphery portion of the portable terminal device, the surface of the upper cover 10 contacting with the rib 12 is narrow, and thus a problem arises in that the water-proof property becomes insufficient in the case the rib 12 provided in the key sheet 11 is displaced in handling the key sheet of the portable terminal device as shown in FIGS. 6A and 6B.

### SUMMARY OF THE INVENTION

[0004] In order to solve the above problem, an object of the invention is to provide a portable terminal device provided with a water-proof structure with improved assembling property and water-proof property so as to prevent entrance of water or the like from the periphery of an operating portion into the inside of the main body of the device.

[0005] In order to achieve the above object, according to a first aspect of the invention, there is provided a portable terminal device comprising: an upper cover having a rib with a substantially convex cross-section provided around an operating portion; a printed board for receiving

an operation input from the operating portion; and a water-proof member provided between the upper cover and the printed board, having a rib with a substantially convex cross-section provided contacting with the printed board with a center shared with the rib with the substantially convex cross-section provided in the upper cover.

[0006] According to a second aspect of the invention, there is provided a portable terminal device comprising: an upper cover having a rib with a substantially convex cross-section provided around an operating portion; a printed board for receiving an operation input from the operating portion; and a key sheet provided with input buttons constituting the operating portion, provided between the upper cover and the printed board, having a rib with a substantially convex cross-section provided contacting with the printed board with a center shared with the rib with the substantially convex cross-section provided in the upper cover.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is an enlarged cross-sectional view showing a part of the configuration of a portable terminal device according to an embodiment of the invention.

[0008] FIG. 2 is an exploded perspective view showing the configuration of the portable terminal device according to the embodiment of the invention, such as a portable phone device.

[0009] FIG. 3 is a cross-sectional view showing a part of the configuration of the portable terminal device according to the embodiment of the invention.

[0010] FIGS. 4A and 4B are exploded plan views showing the configurations of ribs each elongating around the entire periphery of an operating portion of the embodiment of the invention without interruption.

[0011] FIGS. 5A and 5B are cross-sectional views showing a part of the configuration of a conventional portable terminal device.

[0012] FIGS. 6A and 6B are cross-sectional views showing the state of displacement generated by handling a key sheet in the conventional configuration.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] Hereinafter, an embodiment of the invention will be described with reference to the accompanying drawings.

[0014] FIG. 1 is an enlarged cross-sectional view showing a part of the configuration of a portable terminal device according to an embodiment of the invention. In FIG. 1, the water-proof structure of the key sheet periphery portion of the portable terminal device comprises an upper cover 4 having a rib 5 with a substantially convex cross-section provided around an operating portion, a printed board 3 for receiving the operation input from the operating portion, and a key sheet 1 provided between

the upper cover 4 and the printed board 3, having a rib 2 with a substantially convex cross-section provided contacting with the printed board 3 with the center shared with the rib 5 with the substantially convex cross-section provided in the upper cover 4.

[0015] The key sheet 1 is provided with input buttons (key top) comprising the operating portion. Moreover, since the input buttons (key top) comprising the operating portion are a switch, the configuration including the rib 2 of the key sheet 1 to be the breakwater for preventing entrance of water or the like into the switch serves as a water-proof member.

[0016] Furthermore, the key sheet 1 and the rib 2 with the substantially convex cross-section provided therein are made from one material as shown in FIG. 1, that is, made of an elastic member such as a silicone rubber.

[0017] Moreover, as shown in FIG. 1, the rib 2 provided in the key sheet 1 has a substantially V-shaped cross-section smaller than that of the rib 5 provided in the upper cover 4. The rib 5 has a substantially half circular cross-section, with the cross-sectional area larger than that of the rib 2. According to the rib 2 having the substantially V-shaped cross-section, even when the key sheet 1 is deformed by the key operation, since the tip portion of the V-shape bites into the printed board deeply, the key sheet 1 can rapidly restore the original position without dislocation. In this context, the rib 2 having the substantially convex cross-section has a compression margin with respect to the printed board 3.

[0018] FIG. 2 is an exploded perspective view showing the configuration of the portable terminal device according to the embodiment of the invention, such as a portable phone device. In the portable terminal device shown in FIG. 2, the rib 5 with a substantially convex cross-section provided in the upper cover 4 elongates around the entire periphery of the operating portion without interruption. Moreover, the rib 2 with a substantially convex cross-section provided contacting with the printed board 3 in the water-proof member, that is, the key sheet 1 is provided, with the center shared with the rib 5 with a substantially convex cross-section provided in the upper cover 4, elongating around the entire periphery of the operating portion without interruption.

[0019] FIG. 3 is a cross-sectional view showing a part of the configuration of the portable terminal device according to the embodiment of the invention like FIG. 1, but of a range wider than that of FIG. 1. As shown in FIG. 3, the above-described ribs are provided in the upper cover 4 and the key sheet 1 per each input button (key top).

[0020] FIGS. 4A and 4B show the configurations of the rib 5 and the rib 2 each elongating around the entire periphery of the operating portion without interruption shown in FIG. 2. That is, FIG. 4A shows the configuration of the rib 5 provided in the upper cover 4, and FIG. 4B shows the configuration of the rib 2 provided in the key sheet 1.

[0021] As apparent from the above description, the in-

vention provides a portable terminal device comprising an upper cover having a rib with a substantially convex cross-section provided around an operating portion, a printed board for receiving the operation input from the operating portion, and a water-proof member provided between the upper cover and the printed board, having a rib with a substantially convex cross-section provided contacting with the printed board with the center shared with the rib with the substantially convex cross-section provided in the upper cover, so that the effect of preventing entrance of water or the like from the periphery of the operating portion into the inside of the main body of the device can be achieved.

## Claims

### 1. A portable terminal device comprising:

an upper cover having a rib with a substantially convex cross-section provided around an operating portion;

a printed board for receiving an operation input from the operating portion; and

a water-proof member provided between the upper cover and the printed board, having a rib with a substantially convex cross-section provided contacting with the printed board with a center shared with the rib with the substantially convex cross-section provided in the upper cover.

2. The portable terminal device according to claim 1, wherein the rib with the substantially convex cross-section provided in the upper cover elongates around an entire periphery of the operating portion without interruption.

3. The portable terminal device according to claim 1, wherein the rib with the substantially convex cross-section provided contacting with the printed board in the water-proof member is provided, with the center shared with the rib with the substantially convex cross-section provided in the upper cover, elongating around an entire periphery of the operating portion without interruption.

4. The portable terminal device according to claim 1, wherein the water-proof member and the rib with the substantially convex cross-section provided therein are made of an elastic member.

5. The portable terminal device according to claim 1, wherein the rib with the substantially convex cross-section provided contacting with the printed board in the water-proof member is provided with a compression margin with respect to the printed board.

6. The portable terminal device according to claim 1,  
wherein the rib provided in the upper cover has a  
substantially half circular cross-section and the rib  
provided in the water-proof member has a substan- 5  
tially V-shaped cross-section, with an area formed  
by the half circle set larger than an area formed by  
the V shape.
7. A portable terminal device comprising: 10  
an upper cover having a rib with a substantially  
convex cross-section provided around an oper-  
ating portion;  
a printed board for receiving an operation input 15  
from the operating portion; and  
a key sheet provided with input buttons consti-  
tuting the operating portion, provided between  
the upper cover and the printed board, having  
a rib with a substantially convex cross-section 20  
provided contacting with the printed board with  
a center shared with the rib with the substan-  
tially convex cross-section provided in the up-  
per cover.
8. The portable terminal device according to claim 7, 25  
wherein the rib with the substantially convex cross-  
section provided in the upper cover elongates  
around an entire periphery of the operating portion  
without interruption. 30
9. The portable terminal device according to claim 7,  
wherein the rib with the substantially convex cross-  
section provided contacting with the printed board  
in the key sheet is provided, with the center shared 35  
with the rib with the substantially convex cross-sec-  
tion provided in the upper cover, elongating around  
an entire periphery of the operating portion without  
interruption.
10. The portable terminal device according to claim 7, 40  
wherein the key sheet and the rib with the substan-  
tially convex cross-section provided therein are  
made of an elastic member.
11. The portable terminal device according to claim 7, 45  
wherein the rib with the substantially convex cross-  
section provided contacting with the printed board  
in the key sheet is provided with a compression  
margin with respect to the printed board. 50
12. The portable terminal device according to claim 7,  
wherein the rib provided in the upper cover has a  
substantially half circular cross-section and the rib  
provided in the key sheet has a substantially V- 55  
shaped cross-section, with an area formed by the  
half circle set larger than an area formed by the V  
shape.

FIG.1

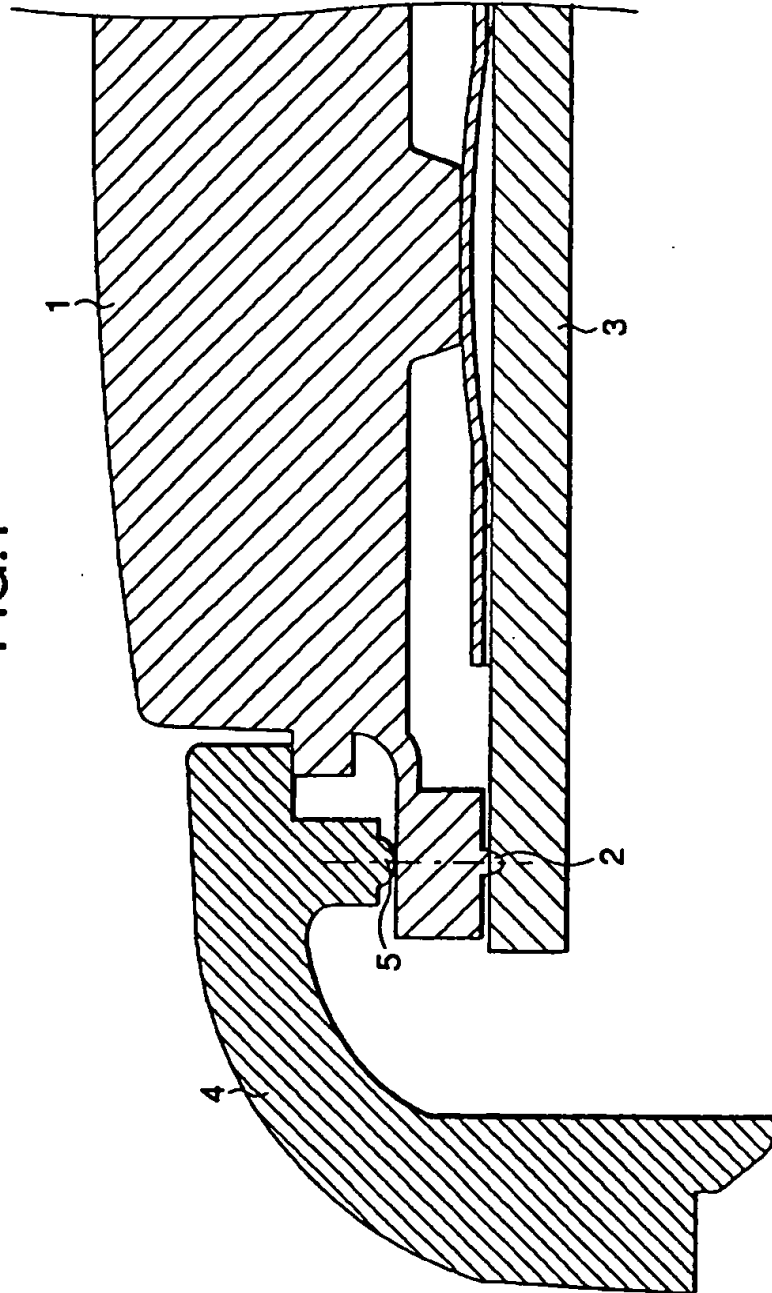


FIG.2

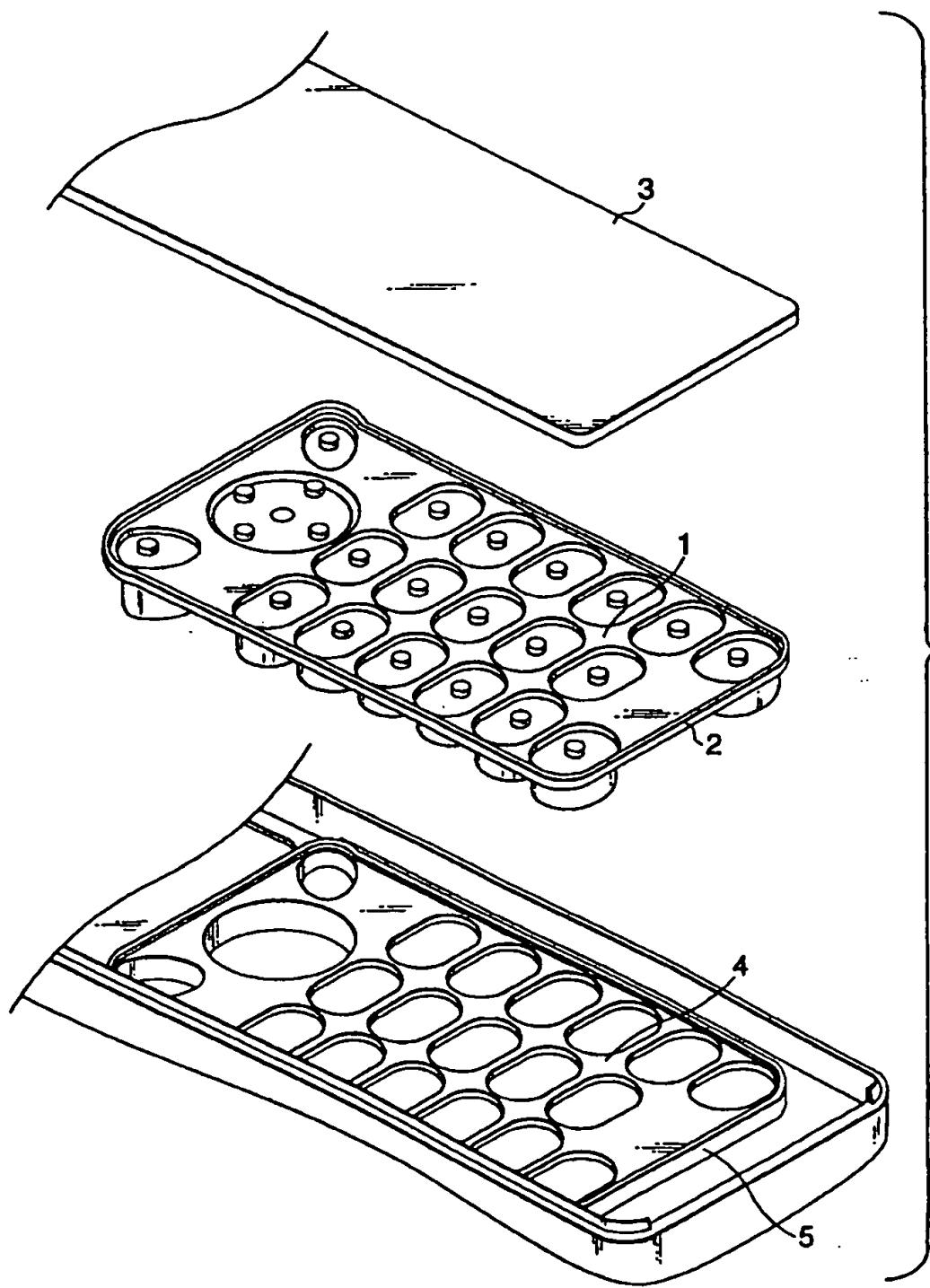


FIG.3

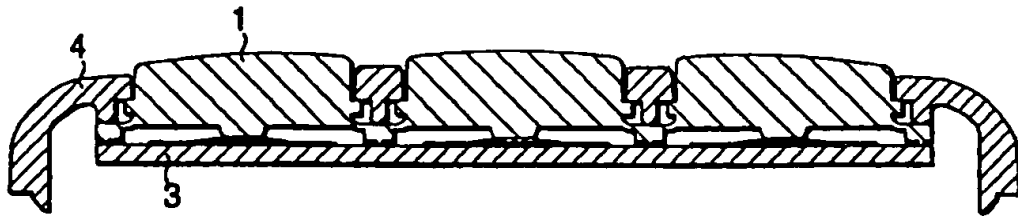


FIG.4A

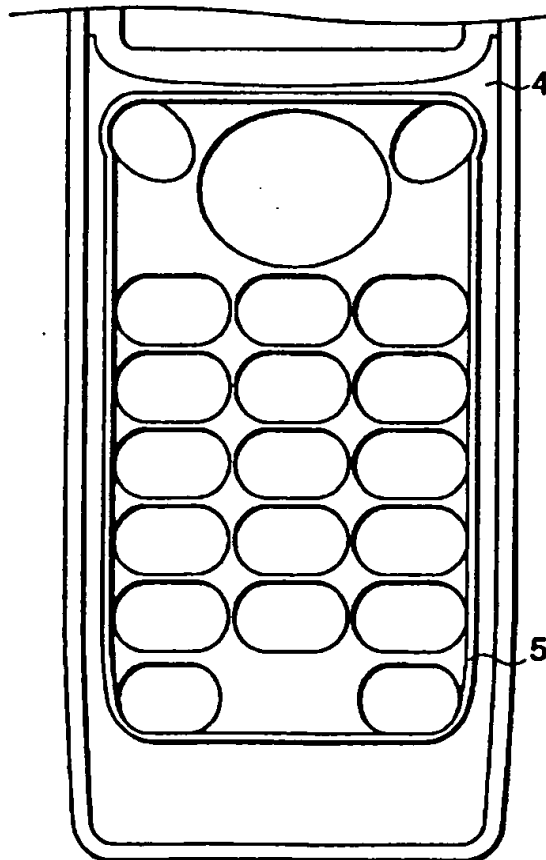


FIG.4B

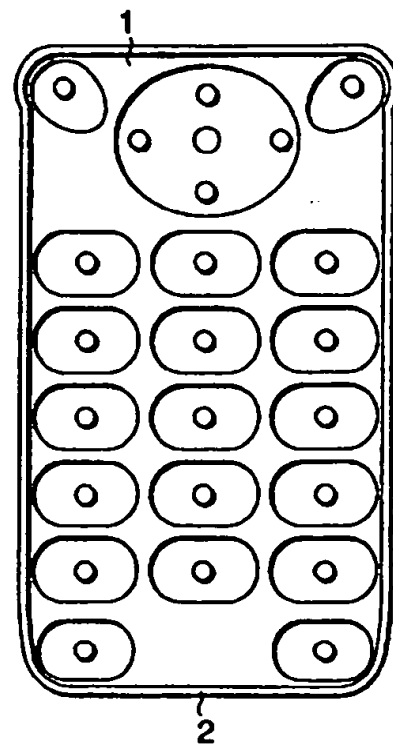




FIG.5A

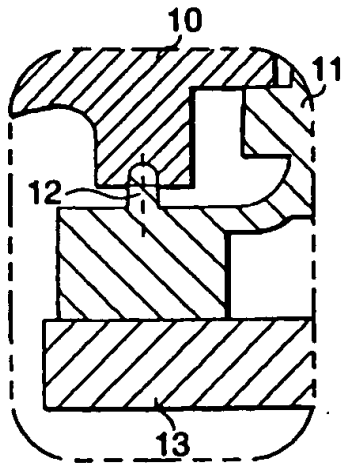


FIG.5B

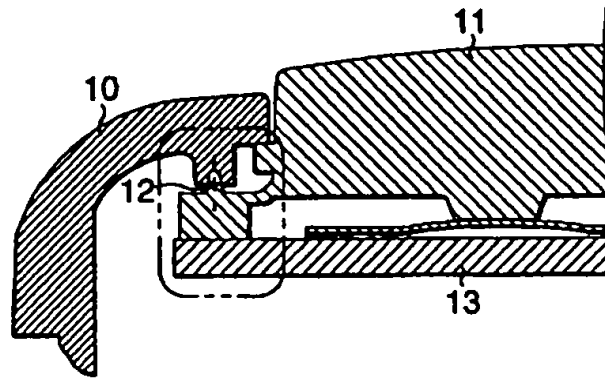


FIG.6A

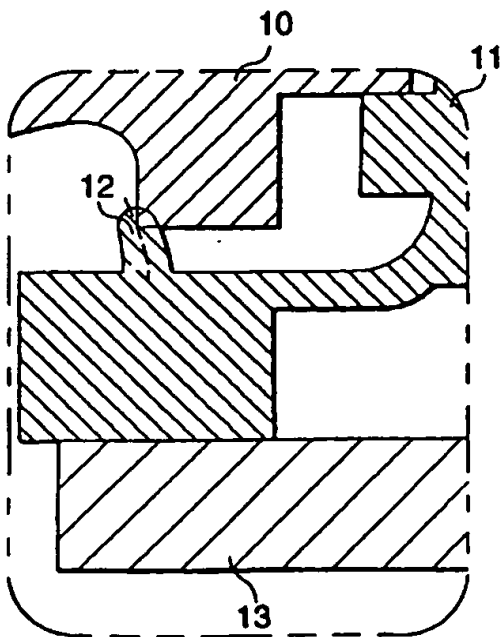
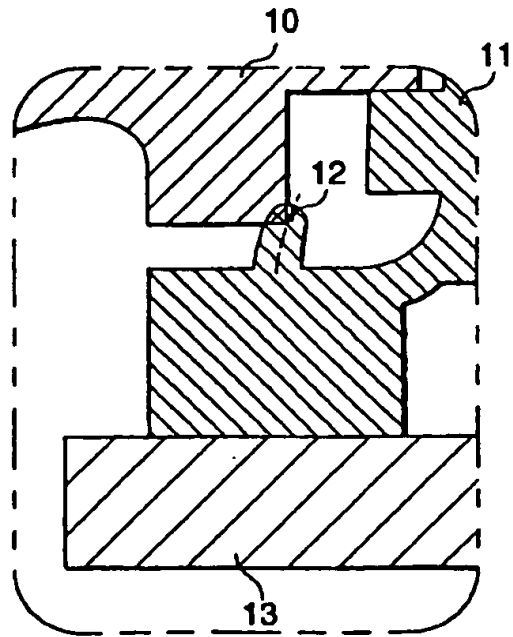


FIG.6B



European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 99 12 2502

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (In C.L.T.)
A	68 1 543 121 A (SUMA SEIKOSHA KK) 28 March 1979 (1979-03-28) * page 2, line 22 - line 66; figure 3 *	1-12	H01H13/70
A	EP 0 685 954 A (KOKUSAI ELECTRIC CO LTD) 6 December 1995 (1995-12-06) * column 3, line 5 - column 4, line 41; figures 1-5 *	1-12	
A	US 5 734 136 A (NEWCOMER KIMBERLY R ET AL) 31 March 1998 (1998-03-31) * column 3, line 7 - column 4, line 15; figures 3-6 *	1-12	
A	DE 30 38 613 A (CASIO COMPUTER CO LTD) 30 April 1981 (1981-04-30) * page 10, line 8 - line 22; figure 4 *	1-12	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (In C.L.T.)
			H01H H05K
Place of search		Date of completion of the search	Examiner
THE HAGUE		14 February 2000	Ramírez Fueyo, M
CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons &: member of the same patent family, corresponding document			

(1) Copy of this report must be filed with the application

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 12 2502

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

14-02-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1543121 A	28-03-1979	JP 52153775 A	21-12-1977
		HK 8781 A	20-03-1981
		MY 34181 A	31-12-1981
		US 4184321 A	22-01-1980
EP 0685954 A	06-12-1995	JP 7336263 A	22-12-1995
US 5734136 A	31-03-1998	NONE	
DE 3038613 A	30-04-1981	CH 648181 A	15-03-1985
		GB 2062304 A, B	20-05-1981

EPO FORM P/99

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82